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Patent Application

for

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SLOTTED PEEP

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Background - Field of Invention

This invention relates to devices used to align equipment with distant objects or targets.

Prior Art

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Because of simplicity of design and traditional acceptance, peep sights have been used on all types of equipment that requires alignment with distant objects or targets.

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A current peep sight is a rear-mounted device consisting of a thin plate made of rigid material with a round aperture near the center. Fig. 2 shows a peep sight 26 and a front sight 28 mounted on top of a piece of equipment 27. The front sight is a free standing pin. A person sighting the equipment, aligns the aperture of the peep sight with the front sight, and a target, 30. The person's ability to sight on the target accurately, is directly dependent on the alignment of the peep sight's aperture, the front sight, and the target. The distance between the target and the front sight is many times greater than the distance between the peep sight and the front sight. A small inaccuracy in the alignment of the two sights will cause a great inaccuracy in the alignment of the equipment with the target.

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Current peep sights are a round aperture peep sight or its variations. Two variations of the round aperture peep are a cross hair peep, and an adjustable peep. The current peep sight fail to address the inadequacies caused by light diffracted within its aperture.

Diffraction of light describes a phenomenon. The phenomenon results in the bending of light toward an obstacle, as the light passes near the obstacle. Why diffraction occurs has not been totally proven, but its effects has been known for centuries. The figures below taken from "Physics — Principles with Applications", Douglas C. Giancoli, author, illustrates the effects of diffracted light.

5 "Figures 14a, 14b, and 14c, Huygen's principle is consistent with diffraction fig. (14a) around the edge of an obstacle, fig. (14b) through a large hole, and fig. (14c) through a small hole whose size is on the order of the wavelength of the wave."

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Fig. (14a) illustrates how light traveling left to right is diffracted an edge of an obstacle. Diffraction alters the lights direction. Light passing near the edge of the obstacle bends toward the obstacle. Diffraction also reduces the intensity of the light by spreading it over a greater area. Because light is bent toward the edge, a person viewing the edge of the obstacle would not see the edge. The person would only see an image of the edge created by diffracted light. The viewer is seeing a false edge of the obstacle.

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Fig. (14c) illustrates the effect of light diffraction as light passes through a small aperture or hole. The aperture being small and the diffraction occurring perpendicular to its edges causes the aperture to appear closed.

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Fig. (14 b) illustrates the effects of light diffraction as light passes through a large aperture or hole. Light passing near the edge of the aperture diffracts outward. Light diffracted by the edges of the aperture bends outward. A viewer never sees the aperture, only an image where diffracted and undiffracted light separate. The viewer sees a false aperture. The size and shape of the aperture the viewer sees is dependent on the light diffracted inside the aperture. When light intensity is inconsistent, the effect of light diffraction is inconsistent. Light passing through the aperture may be more intense to the right. The effect of the light diffraction would be less detectable to the right. The center of the aperture would appear more to the right. Since the viewer never sees the true aperture, the viewer will misalign the aperture and the equipment.

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Light diffraction also reduces the intensity of the light passing through a currently designed peep aperture. When light is dim, a person may be able to see a target with out a peep, but be unable to see the target through the peep.

Oversizing a peep aperture is a current approach to avoiding the effects of diffracted light. Fig.(14 b) illustrates light passing through a large aperture. By oversizing the aperture, light near the center of the aperture will not be greatly diffracted. But oversizing the aperture also increases the inaccuracy of the peep. A large aperture is more difficult to align with a front sight and a target than a small aperture. Also oversizing the peep aperture dose nothing to eliminate the affects of a false aperture.

A cross hair peep can eliminate the inaccuracy created by a false aperture. In doing so the cross hair peep creates additional light diffraction. The cross hair peep consists of a large peep aperture with two thin bars (hairs), one vertical and one horizontal. These bars intersect at the center of the aperture. The thin bars (hairs) provide the user with a consistent location for the center of the peep aperture. A user now aligns the intersection of the cross hairs with the front sight and the target. Compared to other peeps, the cost of manufacturing the cross hair peep is many times greater. Making and installing the intersecting cross hairs is difficult. The fragileness of the hair like bars make the cross hair sight very susceptible to failure. Having edges, the hairs cause additional light diffraction. This additional diffraction occurs at the center of the cross hair peep. A critical area of any peep. The additional diffraction causes the cross hair peep to perform very poorly in low light.

An adjustable peep allows the user to increase the size of the peep's aperture when light is dim and decrease the size of the peep's aperture when light is bright. No attempt is made to eliminate light diffraction from the aperture. The adjustable peep has all the shortcomings of a traditional peep and is more difficult to manufacture.

Currently, light diffraction is being ignored by designers of peeps. The inadequacies caused by light diffraction, such as false aperture, oversized aperture, and poor performance under low light conditions are being ignored. There is a need for a peep sight that eliminates diffracted light from the peep sight's aperture. A peep sight designed to eliminate diffracted light from its aperture would be simple, and traditionally expectable, also more accurate and useful under all light conditions.

Objects and Advantages

Besides the objects and advantages described in the prior art, several objects and advantages of the current invention are:

- A. to provide an aperture that is consistent in size and shape;
- B. to provide a small aperture; and
- C. to provide an aperture that performs well under all light conditions.

Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

Drawing Figures

Fig. 1 shows what a person looking through a slotted peep 22 at the tree 24 would see 26.

Fig. 2 shows a round peep sight 26, and a front sight 28 mounted on equipment 27 and a target 30.

Fig. 3 shows parallel sides 32, and 34 ending at point 36, and point 38.

Fig. 4 shows parallel sides 32, and 34 with line 40 perpendicular to side 32 and passes through end point 36, and end point 38.

Fig. 5 shows a slot used to construct a slotted peep.

Fig. 6 shows three slots arranged to form a slotted peep's aperture 44.

Fig. 7 shows four slots arranged to form a slotted peep's aperture 44.

Fig. 8 shows eight slots arranged to form a slotted peep's aperture 44.

Fig. 9 shows an isometric view of a lower slot of a slotted peep with the group of lines 45 representing the location and direction of the diffracted light.

Fig. 10 shows a front view of fig. 9.

Fig. 11 shows an isometric view of a slotted peep with group of lines 45 representing the location and direction of the diffracted light.

Fig. 12 shows a front view of the slotted peep shown in fig. 11.

Fig. 13 shows the cross section view of the edge of sides 32, 34, and 42 with line 46 the width of the edge.

Fig. 14 A, B, and C illustrate the well known principal of light diffraction.

Reference Numerals In Drawings

20 a tree as seen by user

22 slotted peep

24 tree

26 peep sight with a round aperture

27 equipment

28 front sight

30 target

32 first side of slot

34 second side of slot

36 end point of side 32

38 end point of side 34

40 straight line

42 closed end of slot

43 slot

44 slotted peep aperture

45 group of lines showing the location
and direction of the diffracted light

46 edge of sides 32, 34, and 42

5 Description

Fig. 1 Shows a slotted peep made up of four slots 22. Each slot has an open end. A user looking through an aperture of the slotted peep toward a tree 24 would see 20. The diffracted light darkens the slots. The user will see an open space with four sides and the tree visible within it. The tree appears with the similar clarity when seen through the aperture as when not seen through the aperture.

Fig. 2 show a current peep sight and a front sight mounted on equipment. The peep sight 26 has a round aperture. The distance between front sight 28, and target 30 is much greater then the distance between sight 26, and 28. In the field the ratio of these distances could be much greater. A small error in the alignment of peep sight 26, and front sight 28 can cause a large error in the alignment of equipment 27, and target 30.

Fig. 3 shows two parallel sides 32, and 34, equal in length and having end points 36, and 38.

Fig. 4 shows a straight line 40 drawn perpendicular to side 32 and passing through end point 36. Line 40 will pass through end point 38. Line 40 is perpendicular to line 34.

Fig. 5 shows side 42 as curved and forming the closed end of a slot 43 of a slotted peep. The slot has three sides and an open end.

Fig. 6, 7, and 8 shows different forms of slotted peeps. A slotted peep consists of three or more slots 43 similar to fig. 5. The slots are arranged with point 36 of one slot coinciding with point 38 of the adjacent slot. Curved side 42 is the outermost side. The perimeter of a slotted peep aperture is defined by the open ends of the slots. Each aperture is indicated by 44. The only physical objects near the perimeter of the aperture are points 36, and 38. These points have little or no edge. A slotted peep aperture has virtually no edges defining it.

Fig. 9 shows an isometric view illustrating light as it passes through a slot 43 of a slotted peep The light, passing right to left, is diffracted by the edges of the slot. The diffracted light, lines 45, bends perpendicular to the sides of the slot and parallel to the opening between points 36 and 38. Light is not diffracted in an open space above and between points 36, and 38. The space 44 above and between points 36 and 38 has no physical edge to cause the light to diffract. Light diffraction is confined to the slot. A slotted peep aperture 44 will be virtually free of diffracted light.

Fig. 10 shows a front view of the slot shown in fig. 9. Fig. 10 illustrates how a slot 43 is able to confine the light diffraction within the slot. The diffracted light, lines 45, is diffracted perpendicular to the edges of sides 32, and 34. Sides 32, and 34 are perpendicular to the opening between points 36, and 38. The light is diffracted parallel to the opening between points 36, and 38. Sides 32, and 34 will not cause light to diffract above points 36, and 38. No light is diffracted vertically because

the slot is open between points 36, and 38. There is no edge at the top of the slot between points 36, and 38 to cause light diffraction. The length of the slot prevents any light diffracted by the bottom edge 42 from affecting the space above points 36, and 38.

Fig. 11 shows an isometric view of four slots. The slots 43 are arranged to form a slotted peep. The lines 45 depict diffracted light being bent perpendicular to the sides of the slots. The aperture of the slotted peep is indicated by 44.

Fig. 12 shows the front view of a slotted peep as illustrated in fig. 11. Each slot 43 functions as described in fig. 10. The diffracted light, lines 45, bending perpendicular to the sides of the slots and parallel to the perimeter of the slotted peep's aperture 44. Light diffraction is confined within the slots. An aperture 44 of the slotted peep is an open space with its perimeter defined by the open ends of the slots. The aperture has no physical edges to diffract light.

Fig. 13 is a cross section view of the edge of sides 32, 34, and 42. Line 46 represents the width of the edge of sides 32, 34, and 42. Edge 46 should be as short as possible. Edge 46 being short reduces the amount of edge at points 36, and 38. The shortness of edge 46 also aids in the control and confinement of the light diffracted by sides 32, 34, and 42.

A slotted peep will meet all the aforementioned objects and advantages. A slotted peep's aperture will be free of shortcomings caused by diffracted light. There are no edges in or around the aperture to cause light to diffract. As light intensity changes causing the effects of light diffraction to change, the size and shape of the slotted peep aperture will be unaffected. The diffraction, directed parallel to the perimeter of the aperture can not affect the aperture. The slotted peep's aperture can be made smaller. The slotted peep's aperture need not be oversized. Diffracted light is confined within the slotted peep's slots. The amount of light diffraction that can occur within the slotted peep's aperture is insignificant and therefore it need not be compensated for. The slotted peep will perform well under all light conditions. The light passing through the slotted peep's aperture is not diffracted away from the user's eye. The user will see just as well through the slotted peep as not through the peep.

A slotted peep can be altered from the above description and still perform adequately. Side 42 need not be curved as long as its edge does not diffract light away from of the slotted peep's aperture. Sides 32, and 34 need not be straight or parallel as long as the edges of sides 32, and 34 do not diffract light away from the slotted peep's aperture. A slot can be any shape as long as it confines the light diffraction within itself and provides the open end needed to define the perimeter of the slotted peep's aperture.

A critical location of a slotted peep is where end points 36, and end points 38 coincide. This location provides the greatest opportunity for light to be diffracted away from the slotted peep's aperture. There may be an insignificant amount of light diffraction in the slotted peep's aperture. This most likely would be caused by the locations where points 36 and 38 coincide. I recommend the locations where points 36 and 38 coincide be sharp corners.

The width and number of the slots of a slotted peep can vary depending on the size of an

aperture desired. The wider the slots and the greater the number of slots, the larger the aperture. I recommend a slot width of approximately 1 mm. and an aperture size of at least approximately 1 mm. square. For ease of manufacturing, I recommend using four slots in a rectangular pattern. Three slots are not recommended.

5 I recommend a length for sides 32, and 34 of approximately 2 mm.

A slotted peep should be housed in a rigid material. I recommend the housing for the slotted peep have a non-reflective surface.

10 While my above description contains many specifics these should not be construed as limitations on the scope of the invention, but rather as a simplification of one preferred embodiment thereof. Many other variations are possible. Accordingly, the scope of the invention should be determined not by the embodiments illustrated, but by the appended claims and their legal equivalents.

Summary

15 The reader will see that a slotted peep of this invention is more accurate and useful than current peeps. The slotted peep confines light diffraction within the slots of the slotted peep. The slotted peep's aperture is made up of open space and surrounded by the open ends of the slots. Therefore the slotted peep's aperture has virtually no edges to diffract light. The slotted peep's aperture will be
20 consistent in size and shape. The slotted peep's aperture can be made smaller. The slotted peep's aperture will be virtually free of diffracted light and need not be oversized. The slotted peep will function well under all light conditions. The slotted peep will provide greater accuracy and utility than current peeps.

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